Express Mail Label No.	Dated: _____

Docket No.: 02567/100F496-US2
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Andrew Eisen

Application No.: 10/031,893

Confirmation Number: 8212

Filed: July 19, 2002

Art Unit: 1652

For: DROSOPHILA RECOMBINATION-ASSOCIATED PROTEIN AND METHODS FOR USE

Examiner: Richard G. HUTSON

SUBMISSION OF FORMAL DRAWINGS

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Dear Sir:

Submitted herewith is one set (twenty-five sheets, figures 1A, 1B, 2A, 2B, 2C, 2D, 2E, 3A, 3B, 3C, 3D, 3E, 3F, 4A, 4B, 4C, 4D, 5A, 5B, 6A, 11, 6B, 6C, 6D, 6E, 6F, 7, 8, 9, 10, 12A, 12B, 13A and 13B) of formal drawings for filing in the above-identified patent application. Kindly substitute the enclosed formal drawings for the informal drawings currently present in the application.

Respectfully submitted,

Dated: December 12, 2003

Mitchell Bernstein, Ph.D.
Reg. No. 46,550
Agent for Applicant(s)

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Post Office Box 5257
New York, NY 10150-5257
212-527-7700

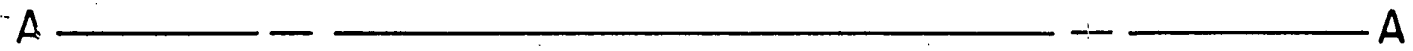
FIG. 1A

DRAP Complete cDNA Clone Insert

```
agcgattacg gtagagatat ggtaatgcaa cggtggatgt gaactccttg     50
gtttgcggtg aatgcgttca acggtggatc ttcgcttgca cctttcgcga    100
tagacgacat acggatacag atacagatac agaatggcct ccaacaacag    150
tagtaccacc gatctggaca gccaggtcaa tgtggaggat ttgcccataa    200
cgttcaaggt gaagtacatt ggttccgaag tggcacgtgg cttatggggc    250
attaagtata cgcgtcgtcc ggttgacata atggtgggcg tggccaagaa    300
cctgccgccc aataaggtgc tgcccaactg cgaactgaag gtgtccaccg    350
acggagtcca gctggagatc atatcgccaa aggccagcat caatcactgg    400
agctatccca tcgacacgat ctcgtatggc gttcaggacc tggtctacac    450
aagggtcttt gccatgatcg tggtgaagga cgagtcgagt ccgcatccct    500
ttgaggttca cgccttcgtg tgcgacagtc gtgcgatggc gcggaagttg    550
acctttgccc tggccggccg ccttccagga ttactcgcga cgggtcaagg    600
aggcaaccgg tgaggaggag ggcgaggcca cgcccagcga cactattaca    650
cccacgcgac acaagttcgc catcgatctg cgaacgccgg agaaatccag    700
gctggcgaac tggagcagga aacggaggcg tagttatcct ggtgatcctg    750
cgttggctcc gtcaatgaga tgtgatgtgt tagttactta acgtccagtg    800
```

A ——— — ——— — ——— A

FIG. 1B




```
ttcactgtat ctgtaaattg tggttctctc acctggtagt tgcctcatac    850
agctaattac ccaaagccta agtgttaata cgatttgtaa acgatttcta    900
aaataaatta cgaatatggt atgtttggct atttgaattg ggctacaacc    950
tgttgatatg ccacttggca aaaaaaaaaa acgccagcac caattctttt   1000
acttctgttt cttgtgaccg acataaaaga tgcaccaaag ctgctattcc   1050
accagcgttc tttattccac gcttgttttc atcattttgt cttccgtaag   1100
ataaattacg taaagcacca caggcatttt tatgtatttc tggagaatca   1150
taagatagca gtcgaactaa tggtggtata cctcccagag atcttgtacg   1200
ttgcttgttt ggatcatcca tgtagcacaa atgctgtaga taggctgctg   1250
cattagcttt tatagcacta ctcgggttgc ttaaaaagct tattacttct   1300
gaaagatttg gatcccgcca tctcattgta gaacaaatat cattttctga   1350
tccttcaatg taatcatcct tttcttcc                          1378
```

Longest ORF	nt 104 - 610
Probable Start Codon	nt 134
CDS Expressed as Recombinant Protein	nt 134 - 610

FIG. 2A

DRAP Coding Sequence - Restriction Map

With 206 enzymes: * MaxCuts: 1

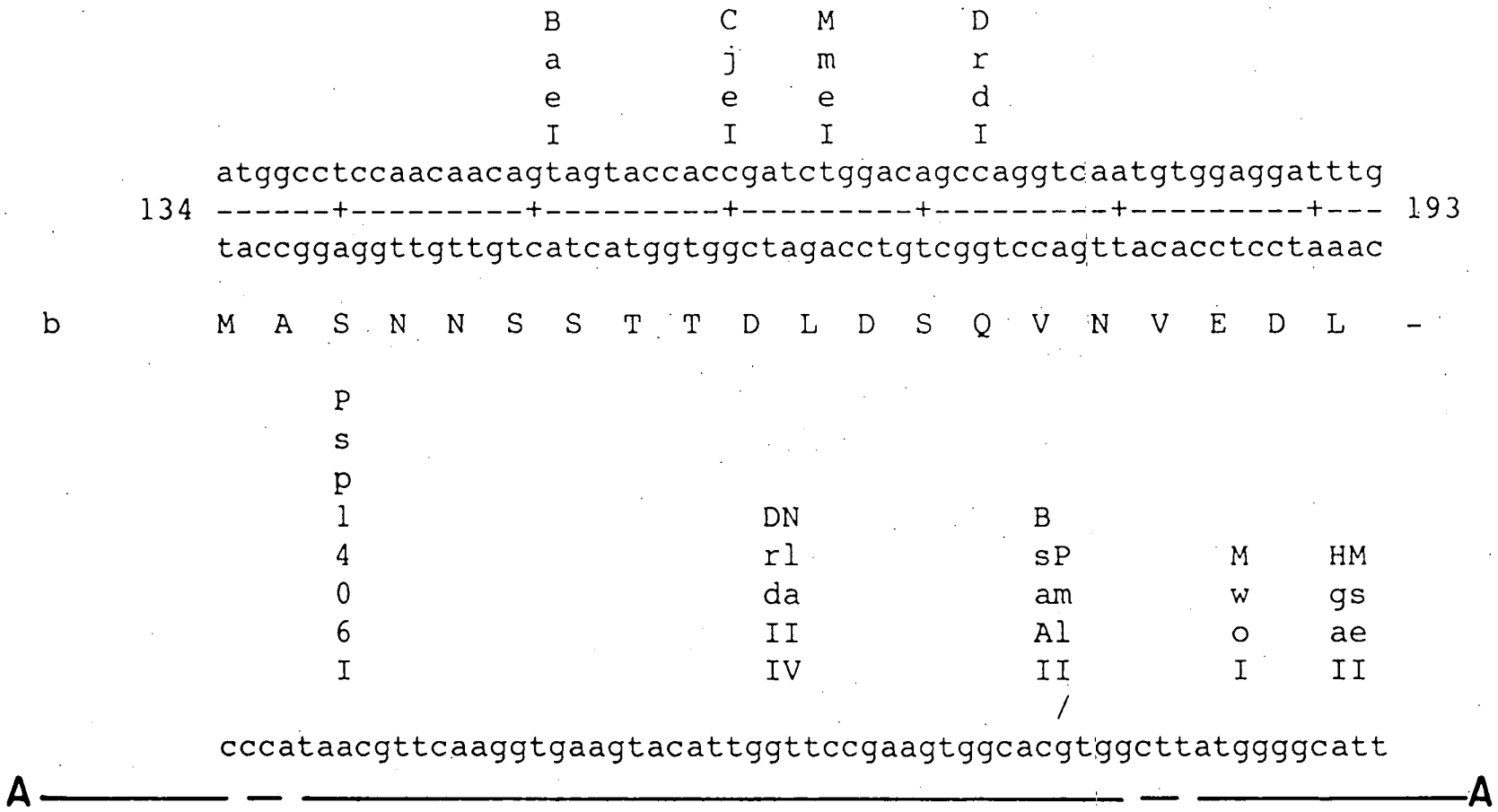
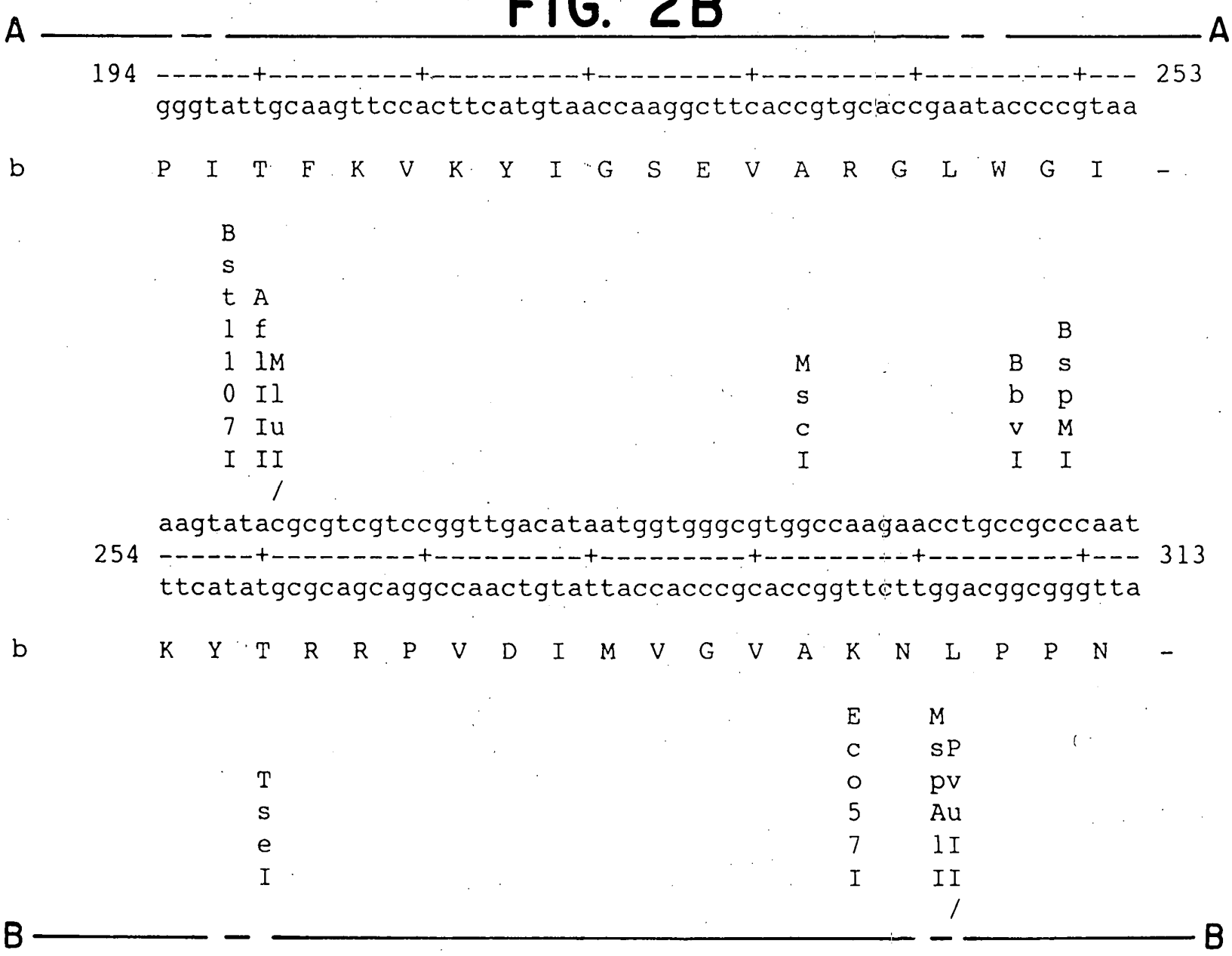


FIG. 2B



10/031,893
4/25

FIG. 2C

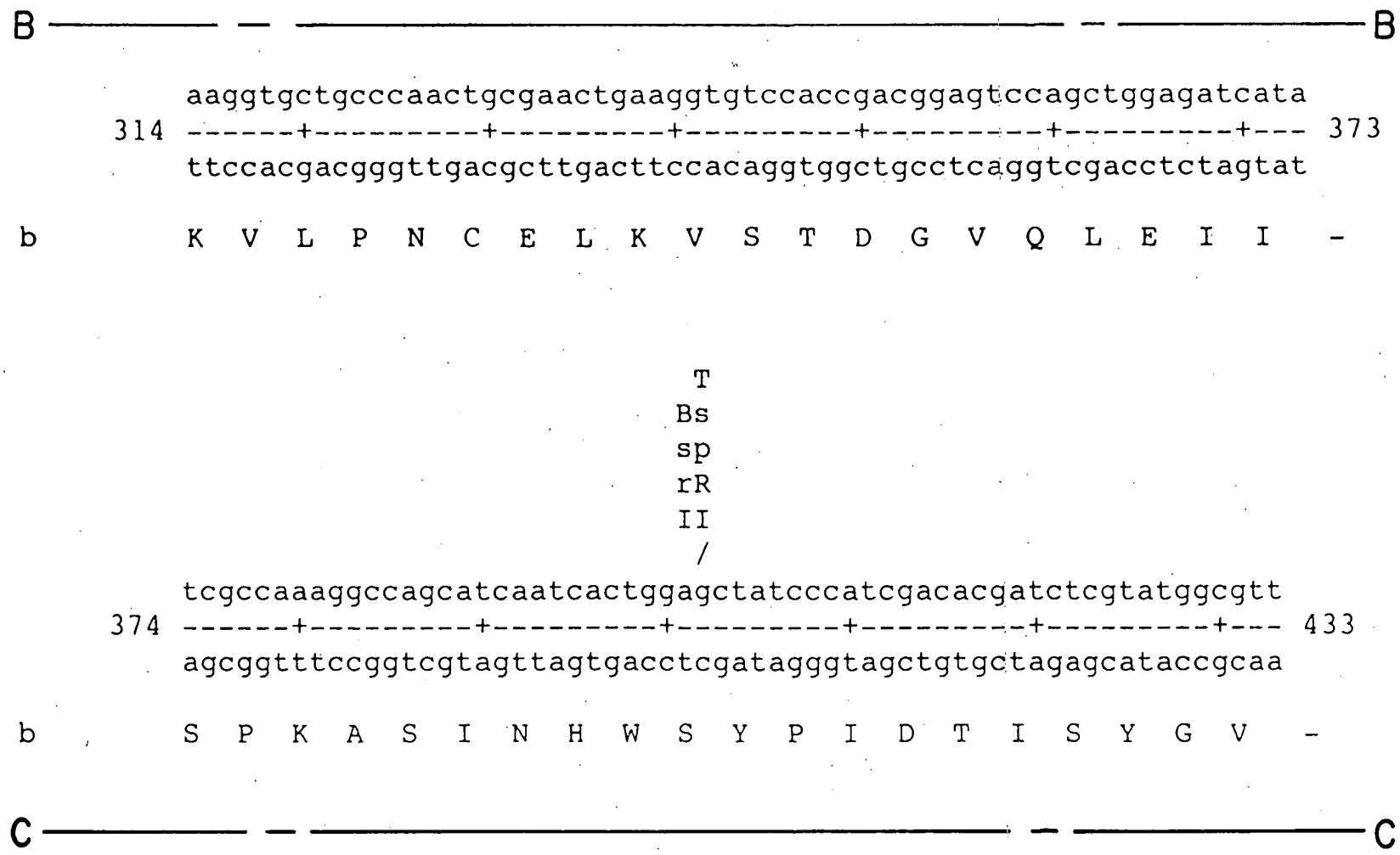

B
B
aaggtgctgcccaactgcgaactgaaggtgtccaccgacggagtccagctggagatcata
314
373
ttccacgacgggttgacgcttgacttccacaggtggctgcctcaggtcgacctctagtat
b
K V L P N C E L K V S T D G V Q L E I I -
T
Bs
sp
rR
II
/
tcgccaaaggccagcatcaatcactggagctatcccatcgacacgatctcgtatggcgtt
374
433
agcggtttccggtcgtagttagtgacctcgatagggtagctgtgctagagcataccgcaa
b
S P K A S I N H W S Y P I D T I S Y G V -
C
C

FIG. 2D

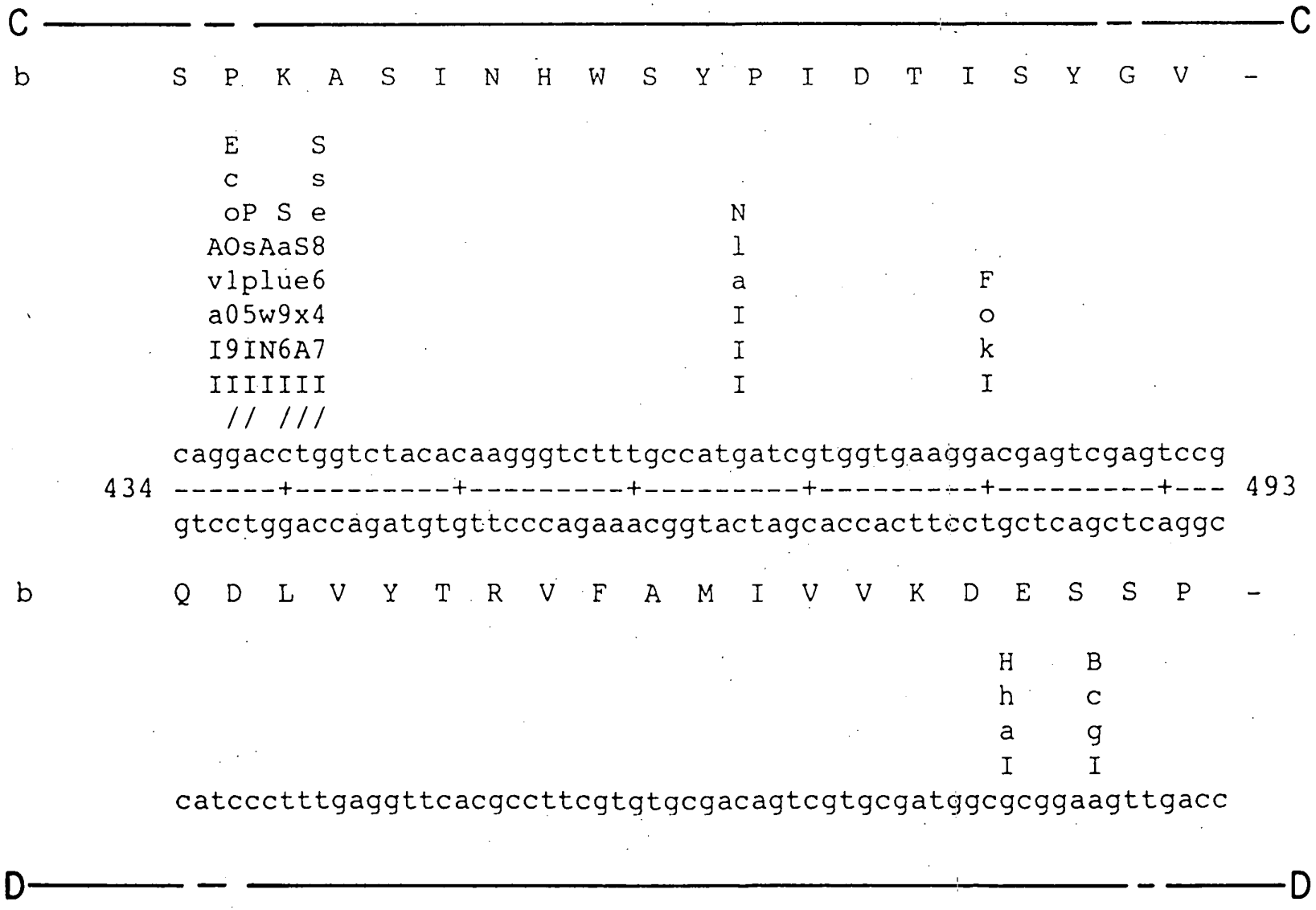
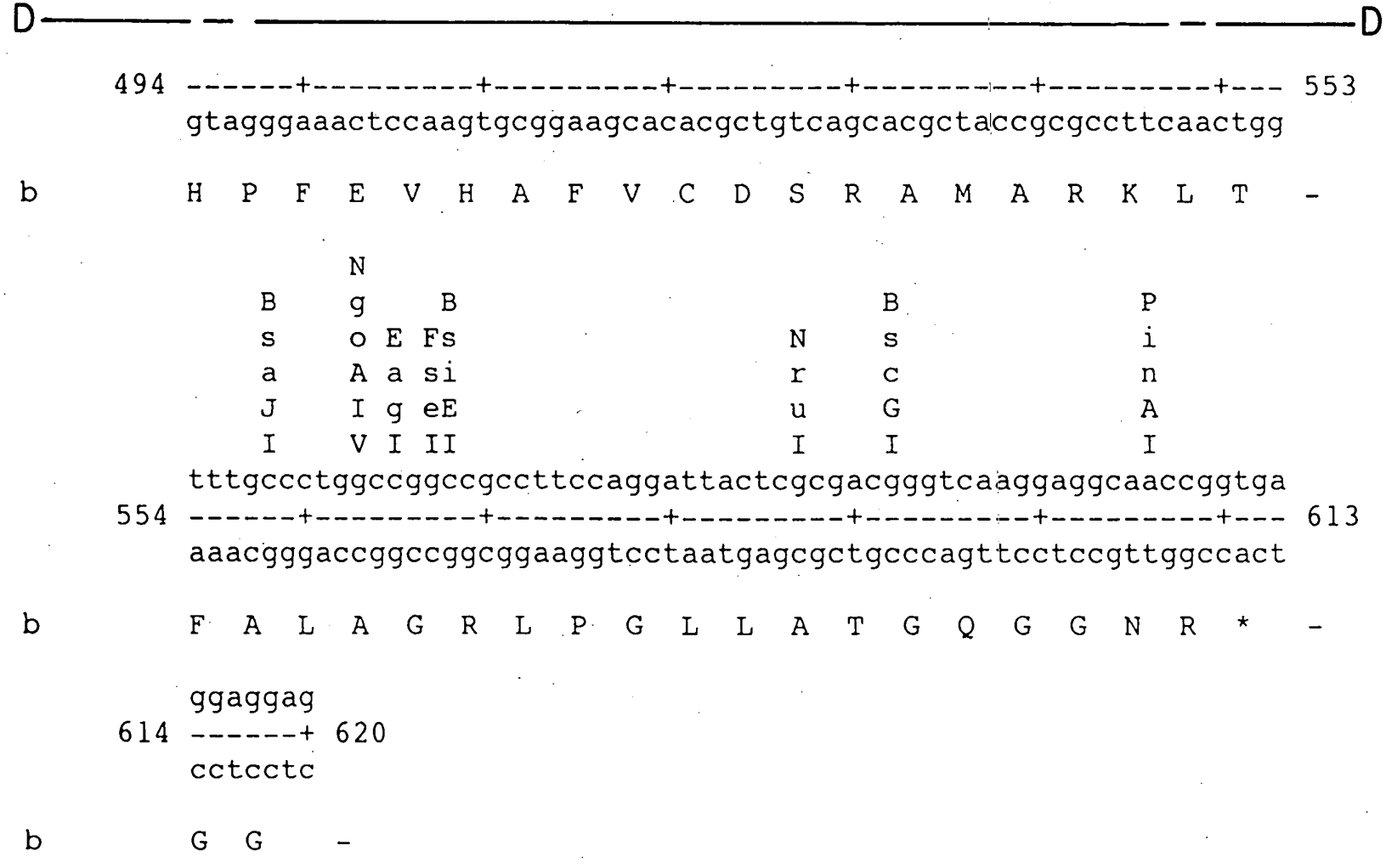

C
C
b S P K A S I N H W S Y P I D T I S Y G V -
E S
c s
oP S e
AOsAaS8
vlplue6
a05w9x4
I9IN6A7
IIIIIII
// ///
N
l
a
I
I
F
o
k
I
caggacctggtctacacaagggtctttgccatgatcgtggtgaaggacgagtcgagtccg
434 ------+---------+---------+---------+---------+---------+---------+--- 493
gtcctggaccagatgtgttcccagaaacggtactagcaccacttcctgctcagctcaggc
b Q D L V Y T R V F A M I V V K D E S S P -
H B
h c
a g
I I
catcccttgaggttcacgccttcgtgtgcgacagtcgtgcgatggcgcggaagttgacc
D
D

FIG. 2E


D
D
494
553
gtagggaaactccaagtgcggaagcacacgctgtcagcacgctaccgcgccttcaactgg
b H P F E V H A F V C D S R A M A R K L T -
N
B g B B P
s o E Fs N s i
a A a si r c n
J I g eE u G A
I V I II I I I
tttgccctggccggccgccttccaggattactcgcgacgggtcaaggaggcaaccggtga
554
613
aaacgggaccggccggcggaaggtcctaatgagcgctgcccagttcctccgttggccact
b F A L A G R L P G L L A T G Q G G N R * -
ggaggag
614
620
cctcctc
b G G -

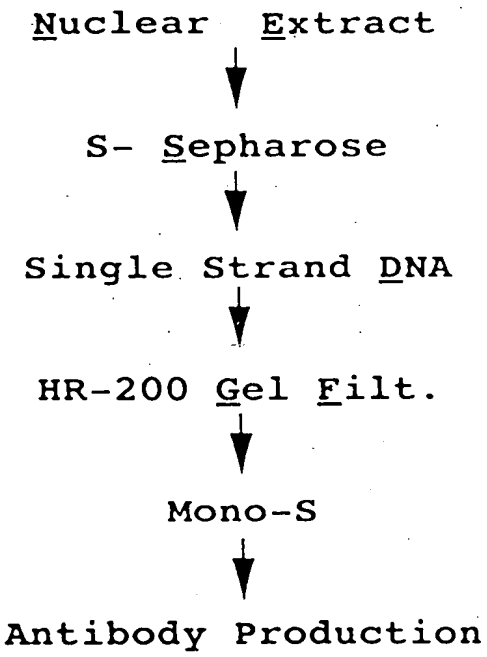
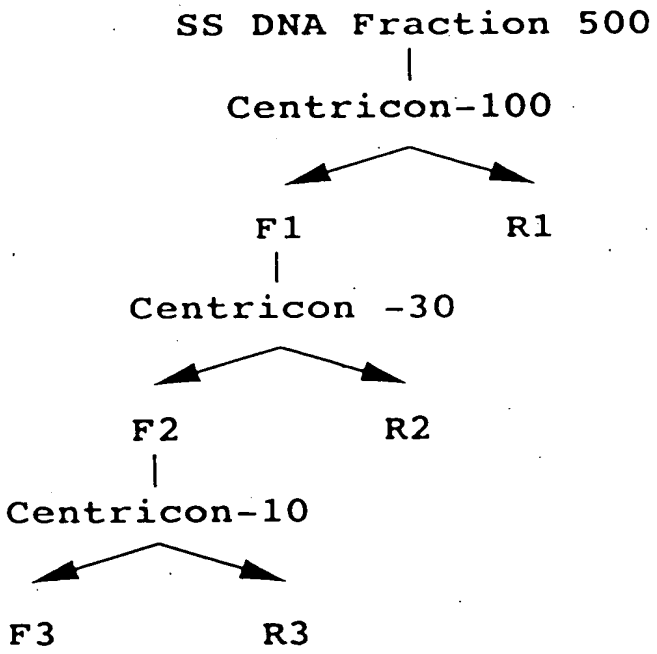

Nuclear Extract
S- Sepharose
Single Strand DNA
HR-200 Gel Filt.
Mono-S
Antibody Production

FIG. 3A

FIG. 3B


SS DNA Fraction 500
Centricon-100
F1
R1
Centricon -30
F2
R2
Centricon-10
F3
R3

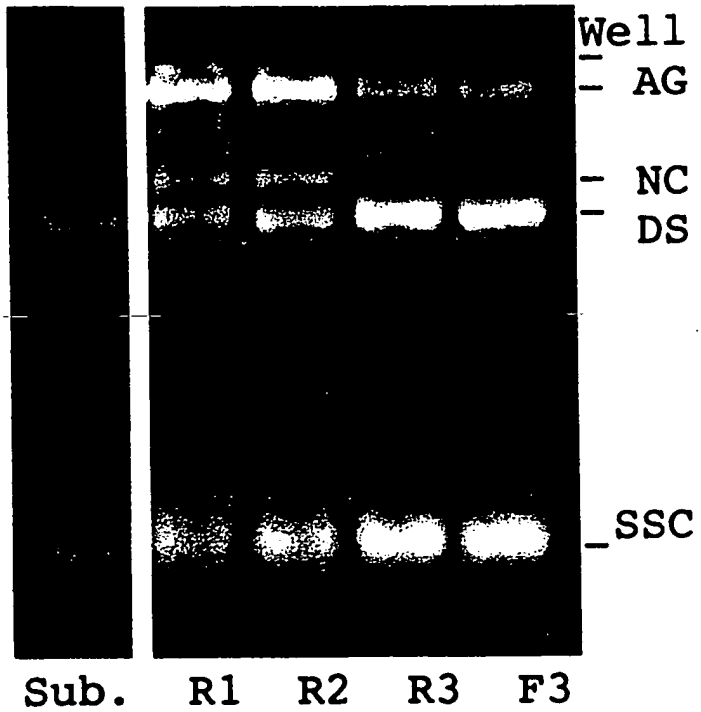
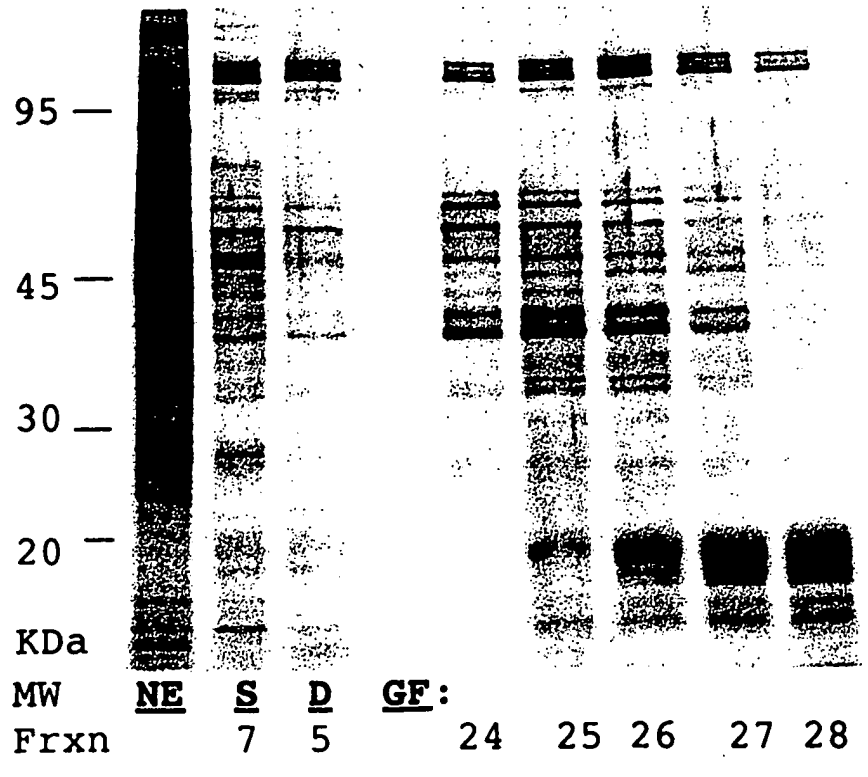

Well
AG
NC
DS
SSC
Sub.
R1
R2
R3
F3

FIG. 3C

FIG. 3D


95
45
30
20
KDa
MW
NE
S
D
GF:
Frxn
7
5
24
25
26
27
28

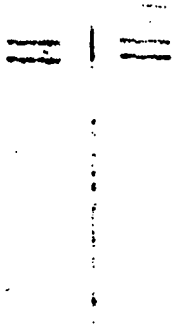


FIG. 3E

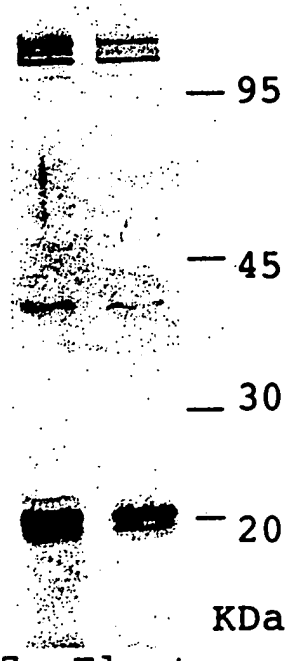


FIG. 3F

FIG. 4A

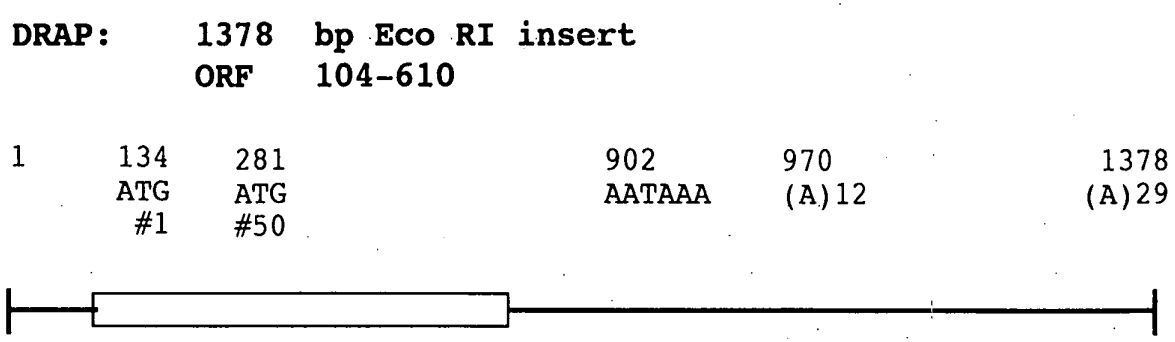

DRAP: 1378 bp Eco RI insert
ORF 104-610
1
134
ATG
#1
281
ATG
#50
902
AATAAA
970
(A)12
1378
(A)29

FIG. 4B

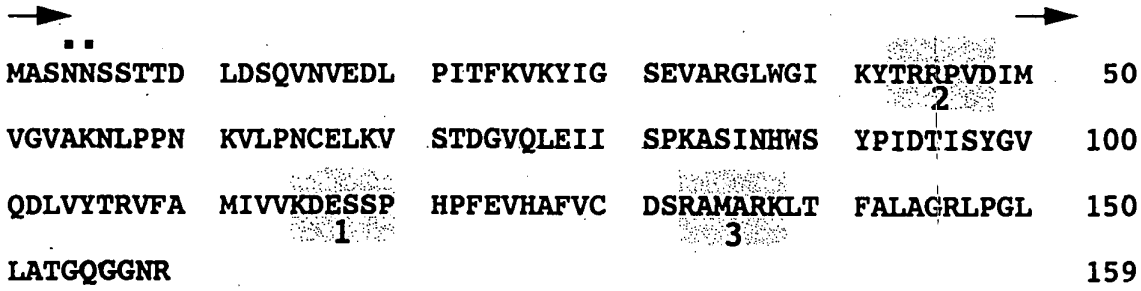

MASNNSSTTD LDSQVNVEDL PITFKVKYIG SEVARGLWGI KYTRRPVDIM 50
VGVAKNLPPN KVLPNCELKV STDGVQLEII SPKASINHWS YPIDTISYGV 100
QDLVYTRVFA MIVVKDESSP HPFEVHAFVC DSRAMARKLT FALAGRLPGL 150
LATGQGGNR 159
1
2
3

FIG. 4C

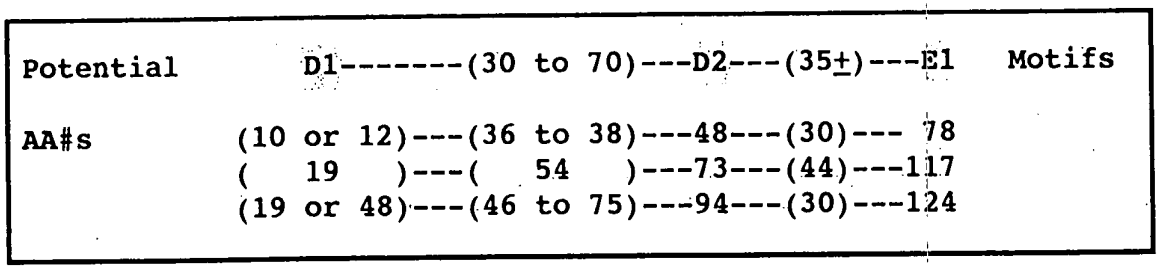


FIG. 4D

Rad 51	Mouse - Human	L L I V - D - S
Rad 51	Yeast	L I V V - D - S
DCM 1	Yeast	L I V V - D - S
RecA	E. Coli	V I V V - D - S
Drosophila DRAP		M I V V K D E S S P
FLP Recombinase		M I A L K D E T N P
T4 Gene 32 Protein		I L V V K D P A A P
		M I A V - DVE M G E
		K - GFS S E
Human Topoisomerase I		I K D E - - P
		K D G S S E
		GFS S P

FIG. 5A

FIG. 5B

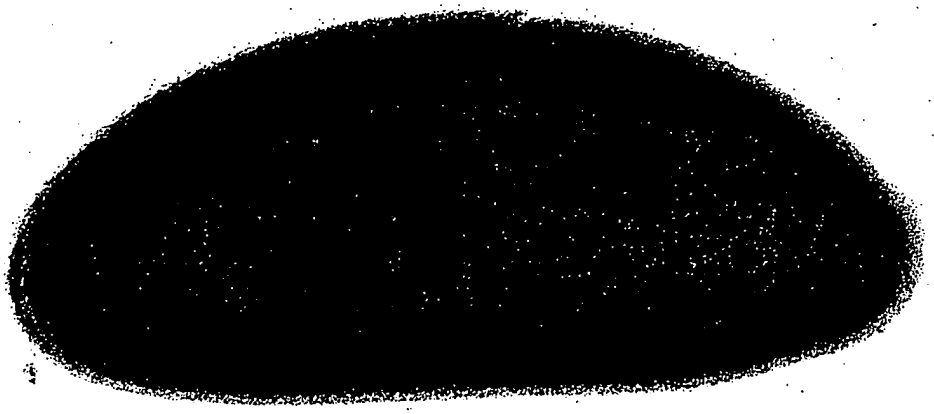


FIG. 6A

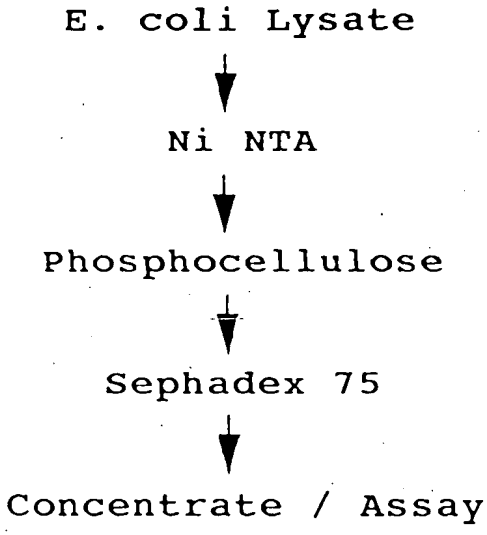


FIG. 11

Targeted Transgenics

Gene	Oligo (No Phenotype)	Oligo + DRAP (Molar Ratio - Protein : Oligo)	
1. N - myc (Exon 1)	16	Low (1:1)	60 OK
		High (100:1)	4 Alive
			11 Stillborn
2. β1 globin (Ala --> Val)	7	High (100:1)	10 OK
			5 Runts
			4 OK
			1 Sickly
3. Agouti	11	High (100:1)	8 OK

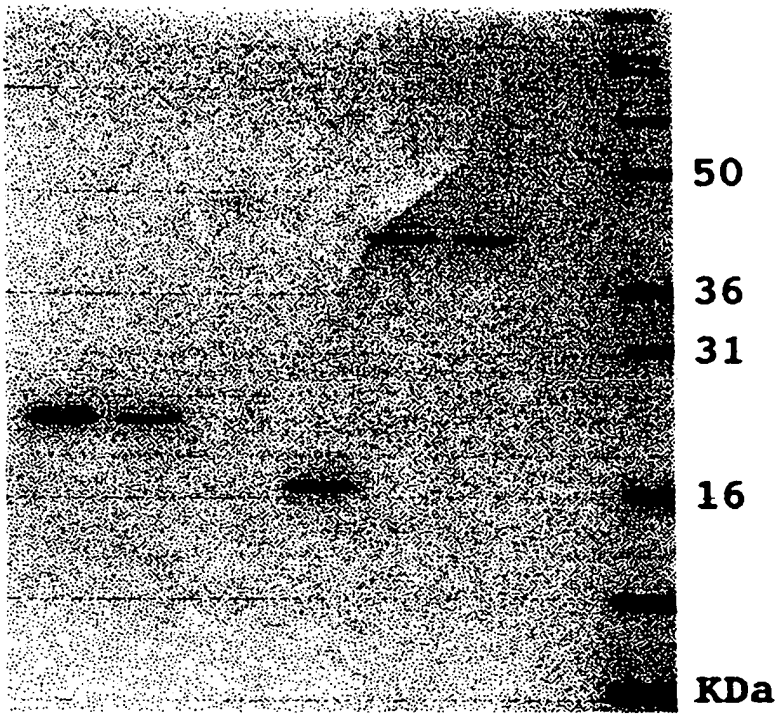

50
36
31
16
KDa
DRAP
SSB
RecA
MW

FIG. 6B

FIG. 6C

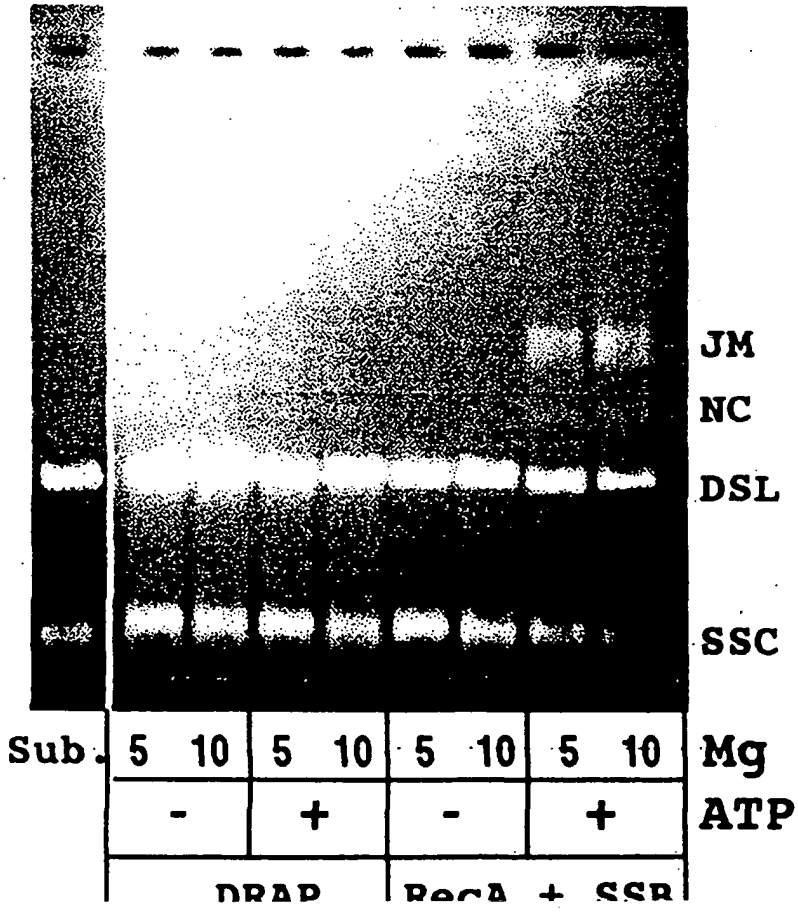

JM
NC
DSL
SSC
Sub.
5
10
5
10
5
10
5
10
Mg
-
+
-
+
ATP
DRAP
RecA + SSB

FIG. 6D

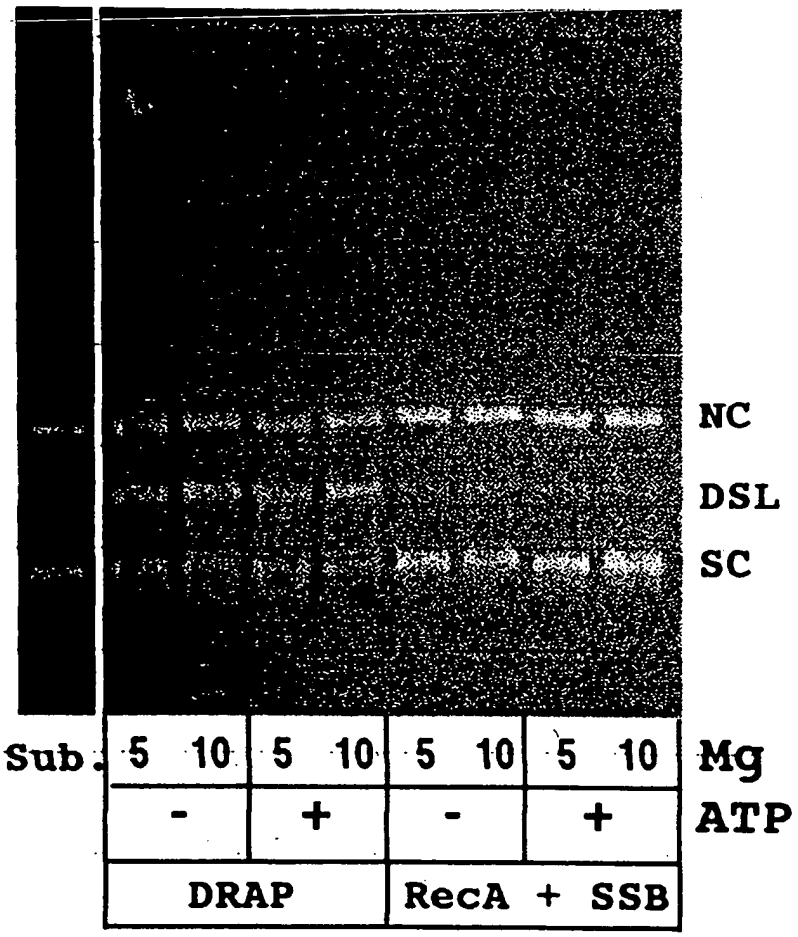


FIG. 6E

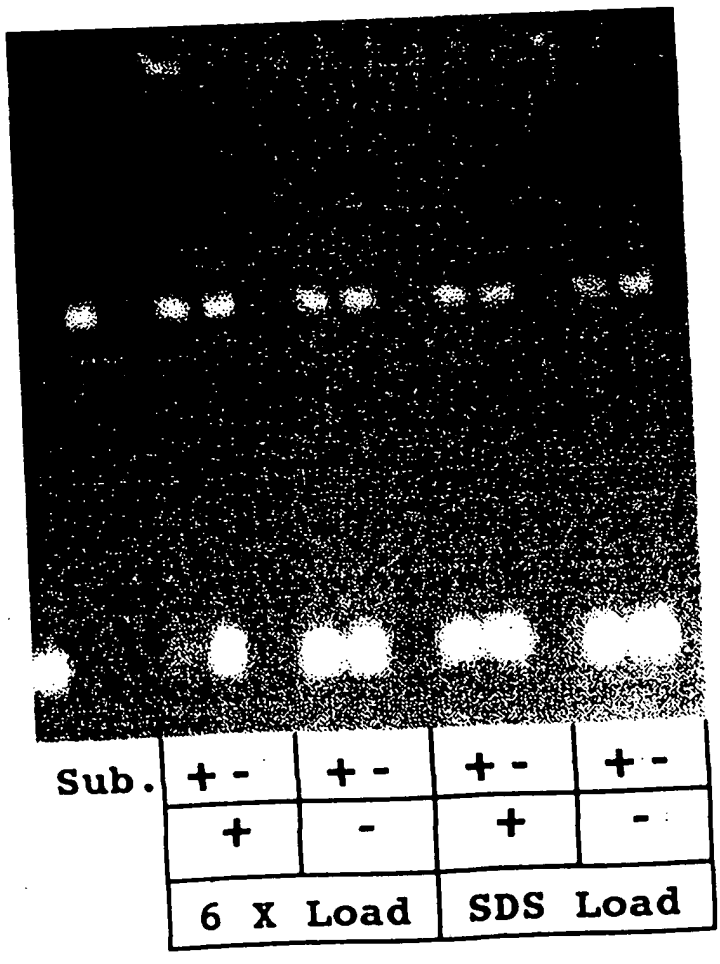


FIG. 6F

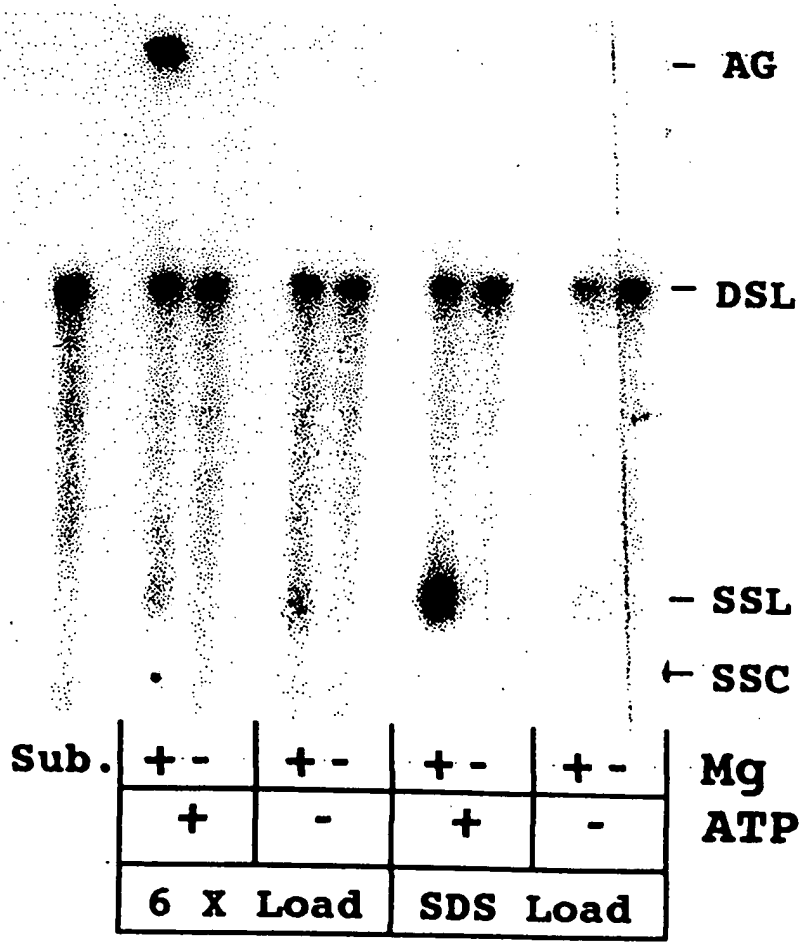


FIG. 7

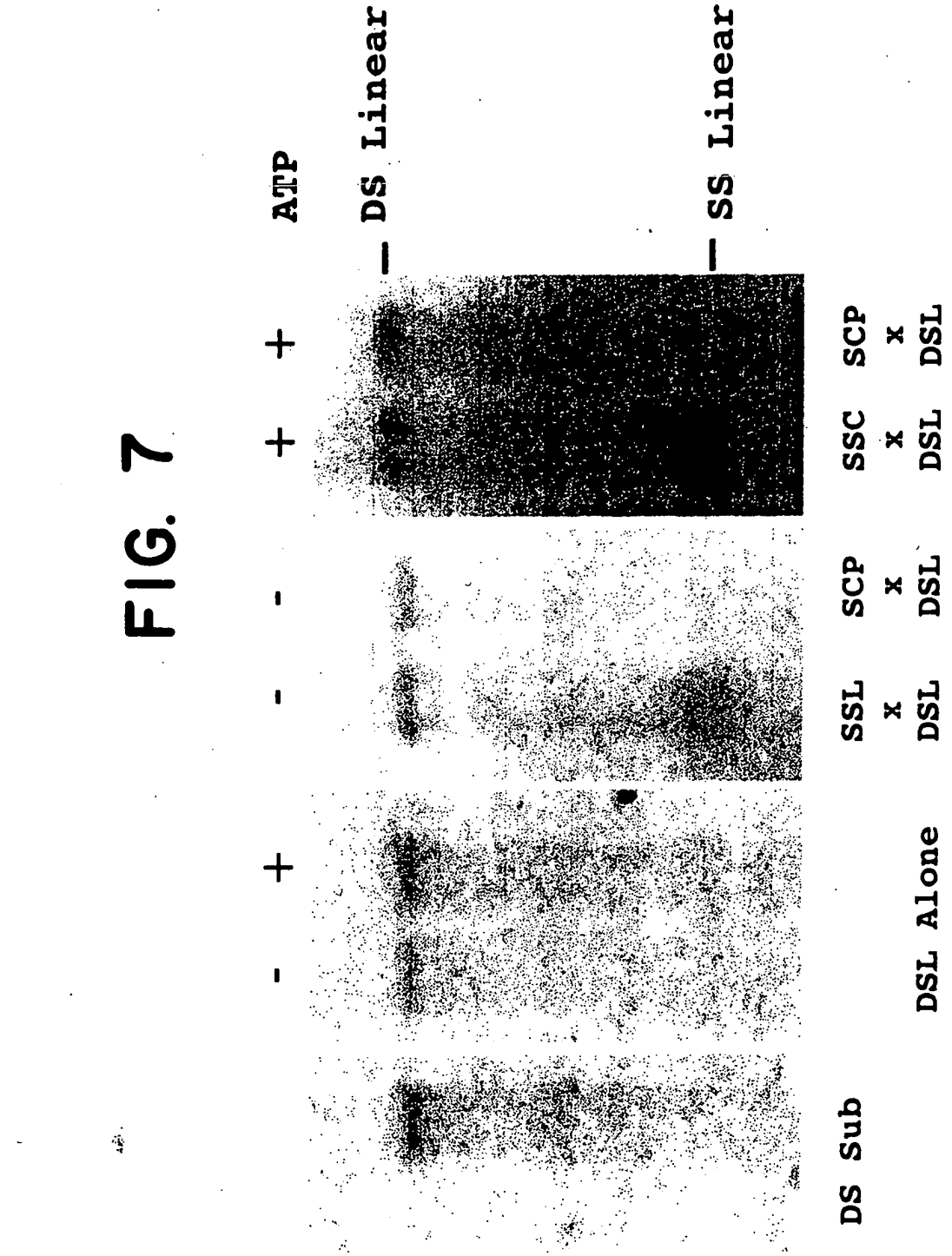

ATP
DS Linear
SS Linear
DS Sub
DSL Alone
SSL x DSL
SCP x DSL
SSC x DSL
SCP x DSL

FIG. 8

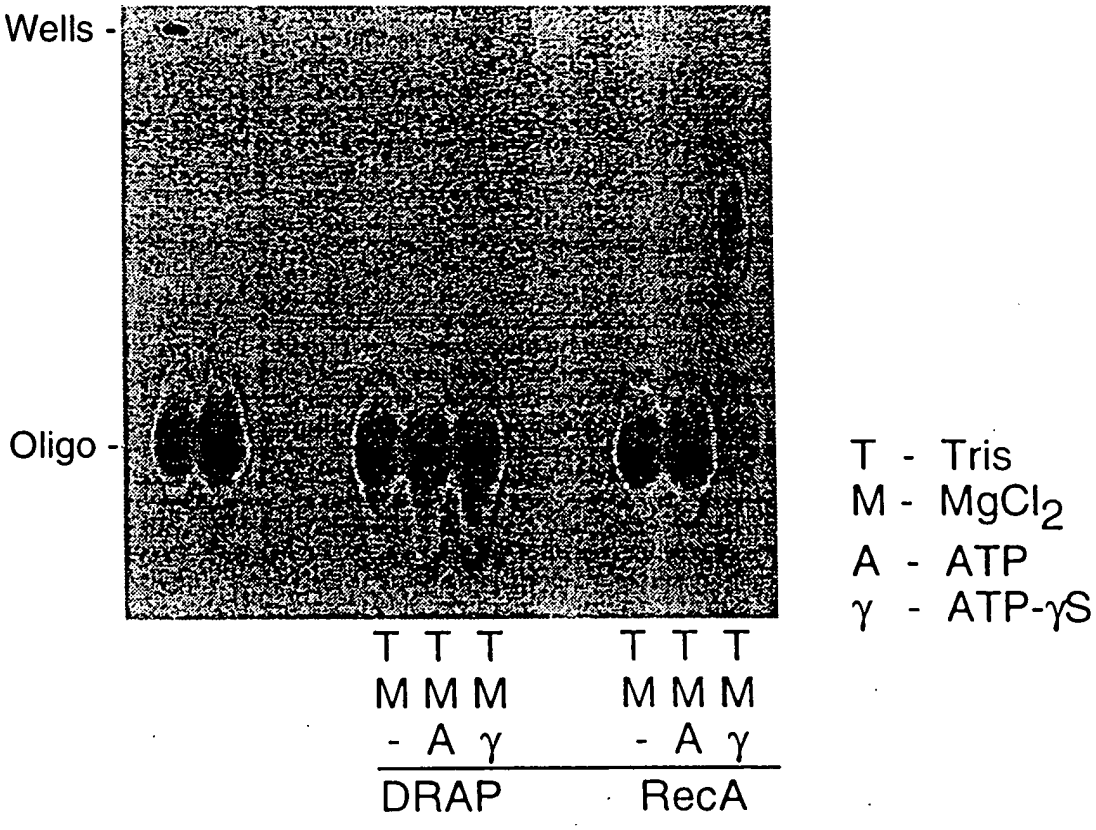

Wells -
Oligo -
T T T T T T
M M M M M M
- A γ - A γ
DRAP
RecA
T - Tris
M - MgCl2
A - ATP
γ - ATP-γS

FIG. 9

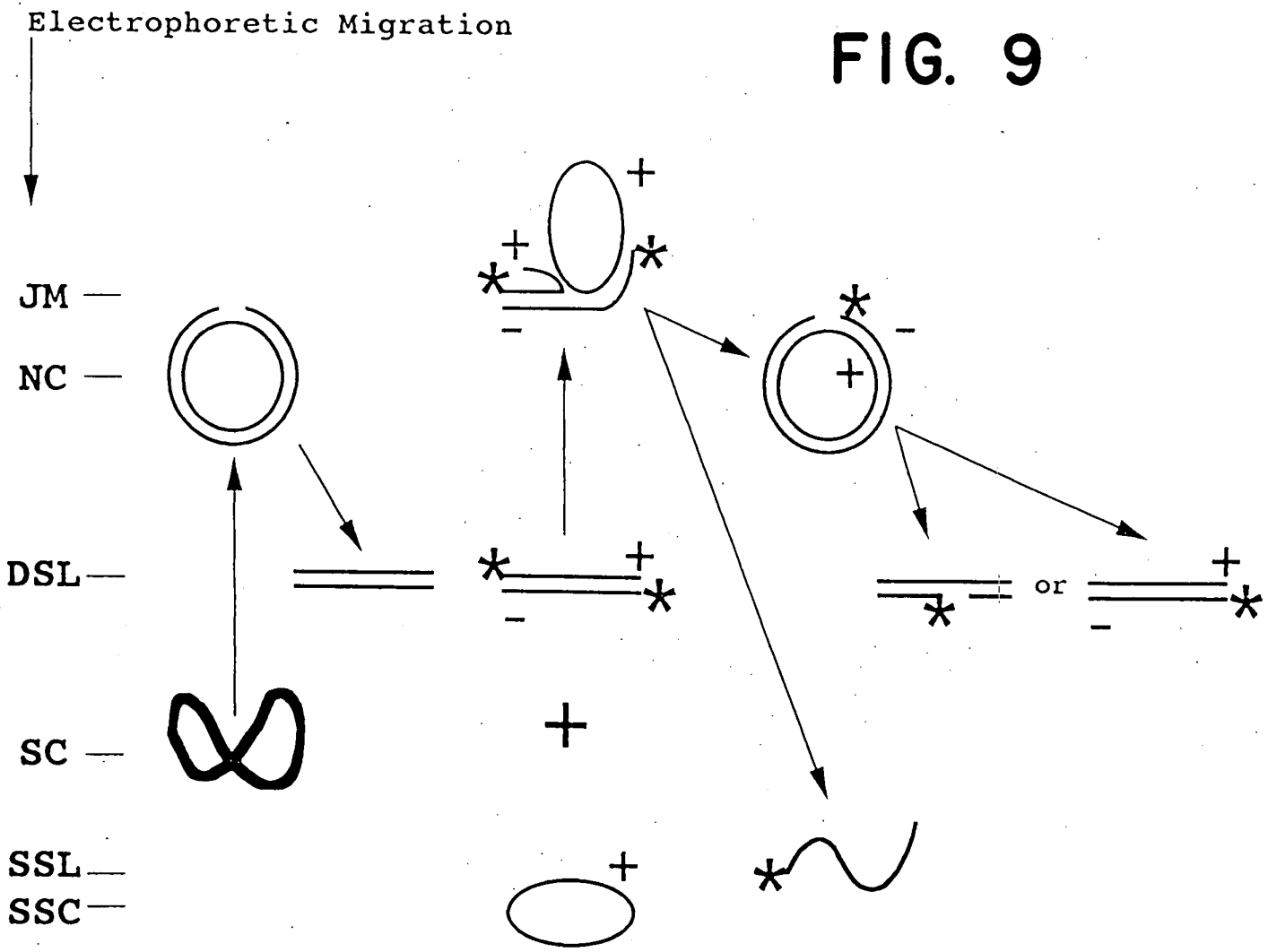

Electrophoretic Migration
JM
NC
DSL
SC
SSL
SSC
or
Topoisomerase DNA Cleavage
DRAP
Typical Strand Transfer JMs, NC & SSL Form
RecA + SSB
Plus Topoisomerase Activity DS Lin. & SS Lin. Form
DRAP

FIG. 10

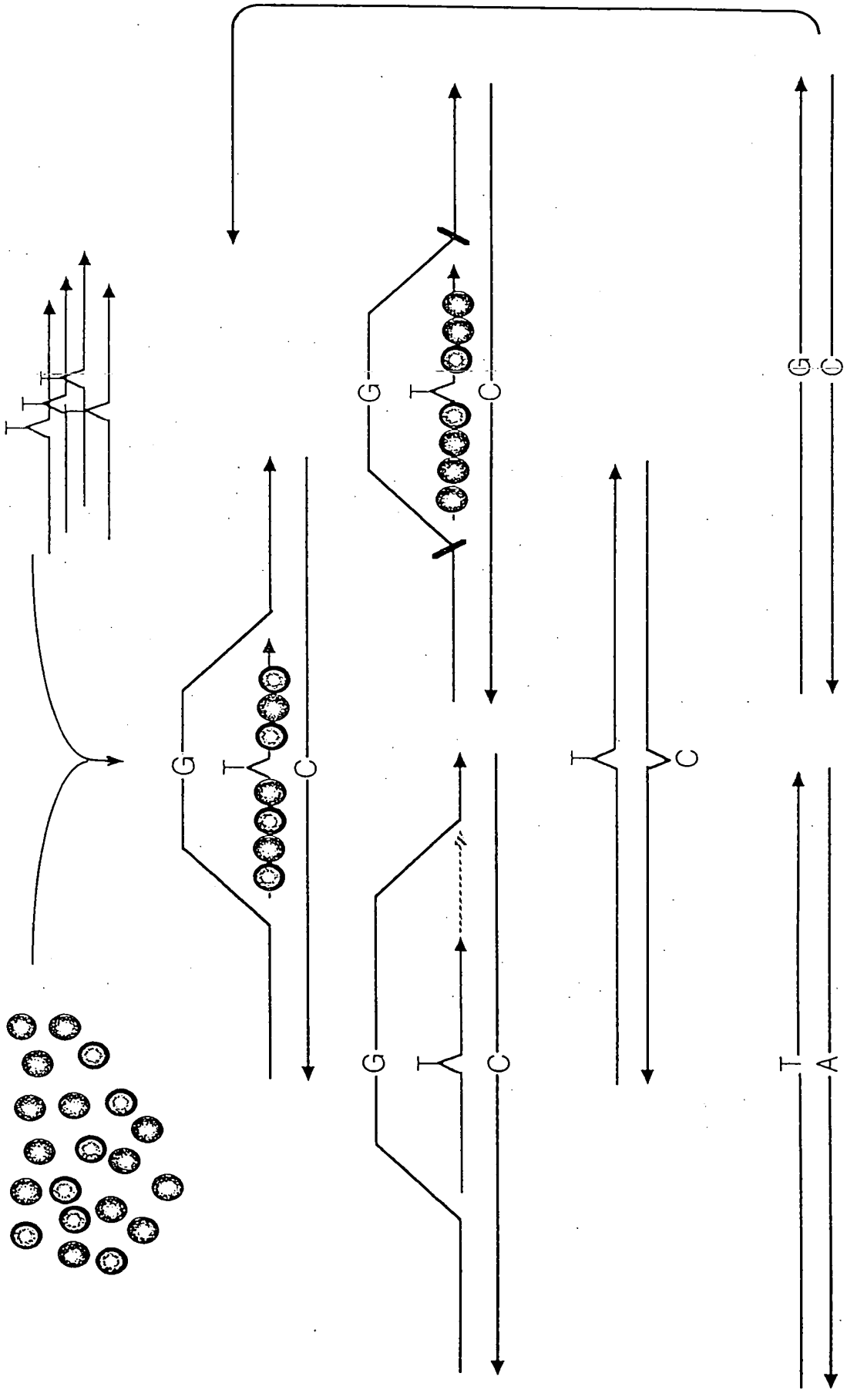


FIG. 12A

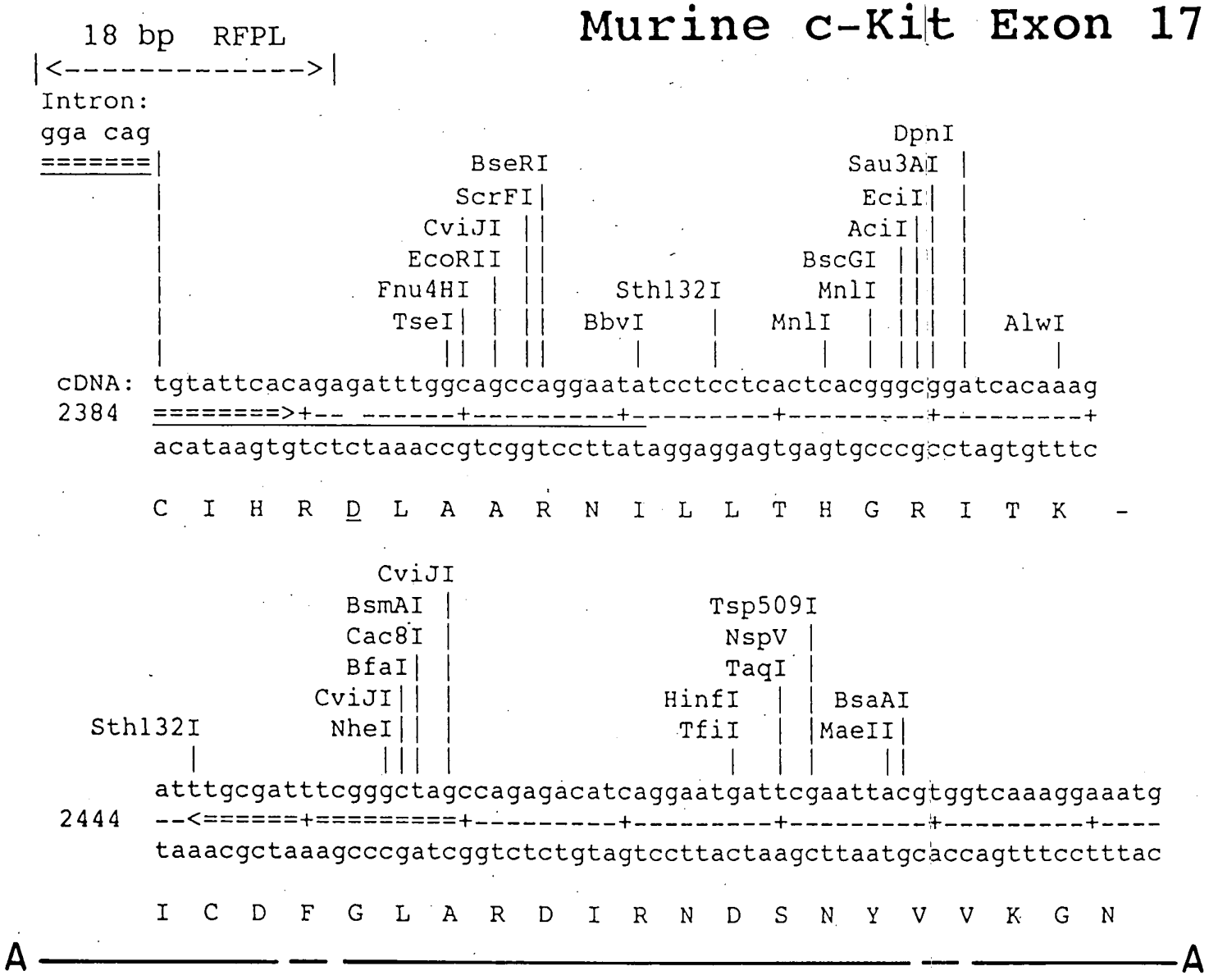
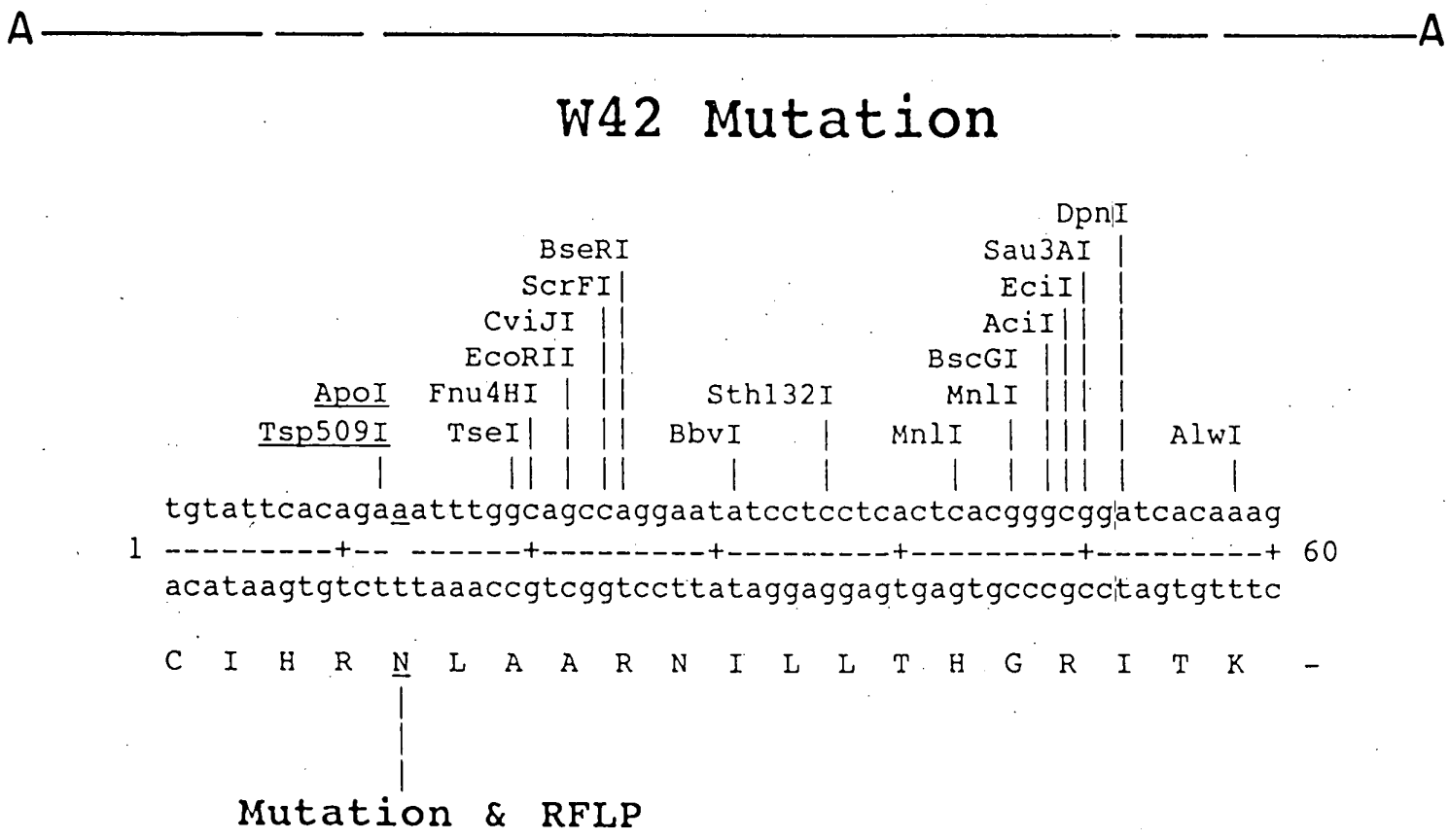

Murine c-Kit Exon 17
18 bp RFPL
Intron:
gga cag
DpnI
BseRI
Sau3AI
ScrFI
EciI
CviJI
AciI
EcoRII
BscGI
Fnu4HI
Sth132I
MnlI
TseI
BbvI
MnlI
AlwI
cDNA: tgtattcacagagatttggcagccaggaatatcctcctcactcacgggcggatcacaaag
2384
acataagtgtctctaaaccgtcggtccttataggaggagtgagtgcccgcctagtgtttc
C I H R D L A A R N I L L T H G R I T K -
CviJI
BsmAI
Tsp509I
Cac8I
NspV
BfaI
TaqI
CviJI
HinfI
BsaAI
Sth132I
NheI
TfiI
MaeII
atttgcgatttcgggctagccagagacatcaggaatgattcgaattacgtggtcaaaggaaatg
2444
taaacgctaaagcccgatcggtctctgtagtccttactaagcttaatgcaccagtttcctttac
I C D F G L A R D I R N D S N Y V V K G N
A
A

FIG. 12B



Underline: Potential Mutagenic Oligo

=====> <====== Potential PCR Primers for RFLP Analysis

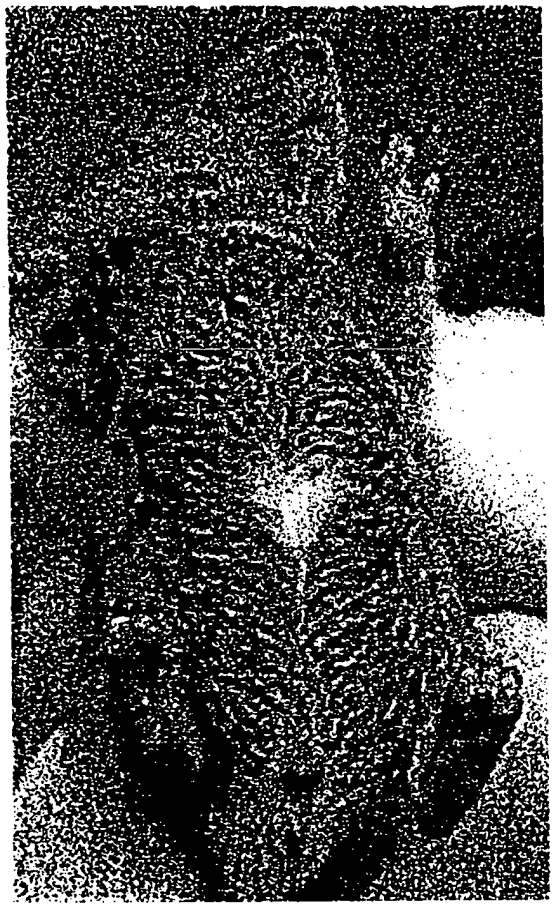


FIG. 13A

FIG. 13B